Panel Meters

FEMA ELECTRÓNICA

Series S

Panel meter 72x36mm

Model S40-R

for Ratiometric signals
Potentiometers up to 5M

Panel meter for ratiometric and potentiometer signals. Accepts 3 wire ratiometric signals. Accepts potentiometers up to 5 MOhm and from 200 Ohm. Reduced size 72x36mm. Reading with 4 digits. 5Vdc transducer excitation. Segment linearization, maximum and minimum display memory, scalable reading, filters, steps, signal autocorrection, "measure" function, peak&hold, alarms with double setpoints, 5 levels of brightness, ... Universal AC and DC power modules and up to 2 modules for signal retransmission and control (relay outputs, analogue outputs, ...).

USER'S MANUAL
(2704R02)

1. Meter S40-R

Panel meter 72x36mm for ratiometric and potentiometer signals

Panel meter for ratiometric and potentiometer signals, from 3 wire transducers. The meter provides +5V (max. 35mA) and a 0V signal, and receives from the transducer a signal between 0 and 5V. Scalable reading. 10 segment linearization.

Instrument with reduced 72x36mm size. Resolution 4 digits with negative sign ("*9999*"/"*-1999*").

Management for up to 2 alarms with 1 or 2 setpoints each, with hysteresis and delays. Provides memory for maximum and minimum, left zeros, display on selectable steps, fixed digits, recursive display filter, password, brightness control, "*measure*" function (visualizes input signal without scaling), offset and signal high autocorrection (assigns the actual signal to the low or high reading), "*peak&hold*" function and password.

Power options with universal AC and DC ranges, and space for 2 additional control and/or signal retransmission modules.

Standard IP54 front protection, with optional upgrade to IP65 protection.

Connections via plug-in screw terminals and configuration via three front push-buttons. For application on industrial environments.

1.1 Order reference

	Model	Power	Option1	Option2	Others
S40 -	**R** -	**H** -	**---** -	**---** -	**---**
		-H *(85-265 Vac/dc)* -L *(11-60 Vdc and 24/48 Vac)*	-R1 *(1 relay)* -AO *(Analogue Output)* *-(empty)*	-R1 *(1 relay)* -AO *(Analogue Output)* *-(empty)*	-65 *(IP65)* *-(empty)*

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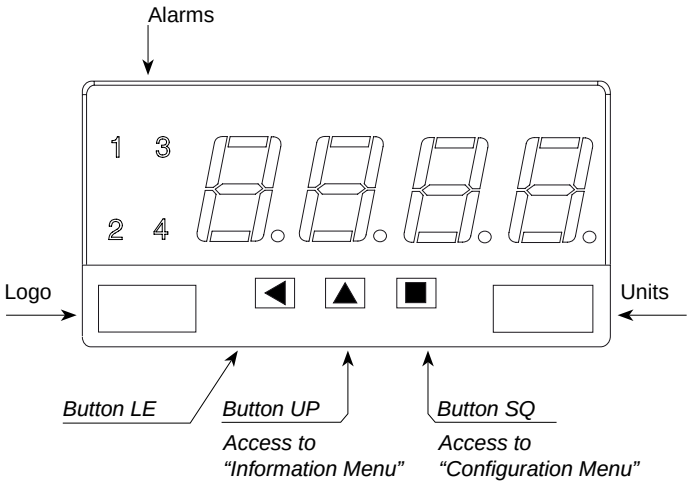
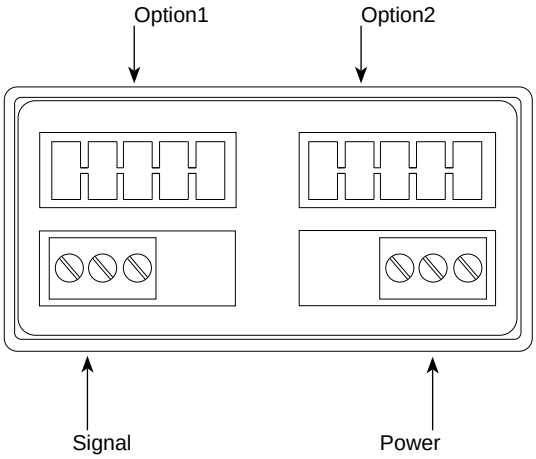
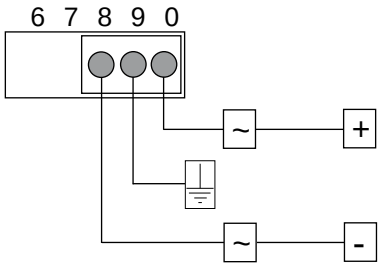
1.2 Front View



1.3 Rear View



1.4 Power Connections

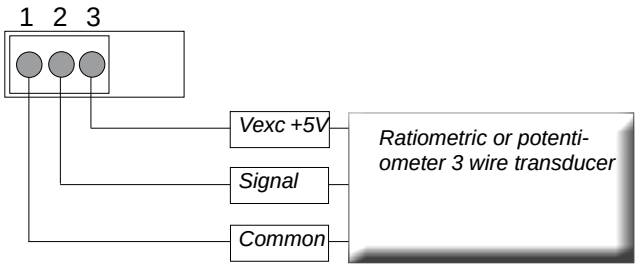


Earth connection - Although a terminal is offered for earth connection, the connection is optional. The instrument does not need this connection for correct functioning nor for compliance with the security regulations.

Fuse - To comply with security regulation 61010-1, add to the power line a protection fuse acting as disconnection element, easily accessible to the operator and identified as a protection device.

Power "H"	fuse 250mA time-lag
Power "L"	fuse 400mA time-lag

1.5 Input signal connections



Example of ratiometric transducer for pressure.

Example of ratiometric transducer for length.

1.6 Technical data

Digits	4
Type	7 segments, red
Height	14 mm
Display maximum	9999
Display minimum	-1999
Decimal point	selectable 8.8.8.8.
Overrange	9999 flashing
Underrange	-1999 flashing

Signals accepted	Ratiometric, potentiometers
Ratiometric	3 wire ratiometric sensors
Potentiometers	Pots from 200 Ohm up to 5 MOhm

The instrument provides two ranges for potentiometer measurement. In Pot<5K measurement range, the measure is direct (no additional configuration is needed). In Pot<5M it is needed to introduce the nominal value of the potentiometer to reach the assigned accuracy. This value is requested when the Pot<5M is selected.

Connections	3 wires
Input impedance	932K
Oversignal	max. 100Vdc

Excitation voltage	
Voltage output	+5Vdc
Max. current	35mA
Protection	against short-circuit

Accuracy at 25ºC	
200R < Pot < 5Mohm	0.15% F.S. ±1 digit
Pot > 5MOhm	0.15% F.S. ±1 digit
Ratiometric	0.15% F.S. ±1 digit
Acquisitions	5 acquisitions / second
Display refresh	5 display refresh / second
Step response time	<200mSec (0% to 99% signal)

Power	
Power "H"	85 to 265 Vac/dc
Power "L"	11 to 60 Vdc and 24/48Vac
Consumption	<4W
Isolation	3500Veff for power "H" 2000Veff for power "L" all levels tested for 60 seconds

Configuration	3 frontal push buttons

Functions available	
Segment linearization	10 segments
Fixed digits	yes, configurable
Filter on display	yes, recursive, configurable
Steps	yes, configurable
Memory of maximum	yes
Memory of minimum	yes
Zeros to the left	yes, configurable
Password	yes, configurable
"Measure" function	yes
Auto correction high	yes
Auto correction low	yes

1.6 Technical data (cont.)

Peak & Hold	yes
Double setpoints	yes
Brightness control	yes, 5 levels

Thermal stability	
offset	10 ppm/ºC
span*	35 ppm/ºC

**span drift includes the offset drift*

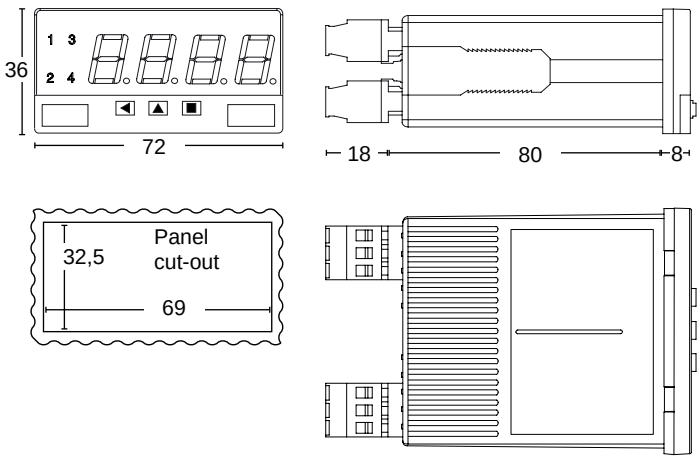
Options	maximum 2

Mechanical	
Mounting	panel
Connections	plug-in screw terminals
Weight	<150 grams
Housing materials	ABS, polycarbonate, vergaflex
Front size	72x36mm
Panel cut-out	69x32.5mm
Deep from panel	98mm (including terminal)

Protection	IP54 standard IP65 optional (sealed front filter. Opening the housing breaks the seal)

Temperature Operation	0 to 50ºC
Temperature Storage	–20 to +70ºC
Warm-up	15 minutes

1.7 Mechanical dimensions (mm)



1.8 Operating the menus

The instrument has two menus accessible to the user :

"*Configuration Menu"* (key SQ)

"*Information Menu"* (key UP)

The *"Configuration Menu"* allows to change the configuration of the instrument. Access to the *"Configuration Menu"* can be password protected with the function "*PASSWORD*". During operation with the *"Configuration Menu"* the alarms are kept "*on-hold*". When leaving the *"Configuration Menu"* the instrument performs a restart, and new configuration is applied. On restart of the instrument, also the control output modules are restarted (relays, analogue outputs, ...).

The *"Information Menu"* is for information only, and it does not accept changes on the displayed information. To enter the *"Information Menu"* press the "*UP*" button. It is not affected by the "PASSWORD" function. Leaving the *"Information Menu"* returns to the measuring state of the instrument, without restart of the unit.

Rollback - After 30 seconds without interaction from the operator, the instrument leaves the menu and returns to the previous working mode. In case of configuration menu, all changes are discarded.

Button SQ - Selects the menu entry currently displayed. When entering a numeric value (for example a setpoint value) validates the value on display.

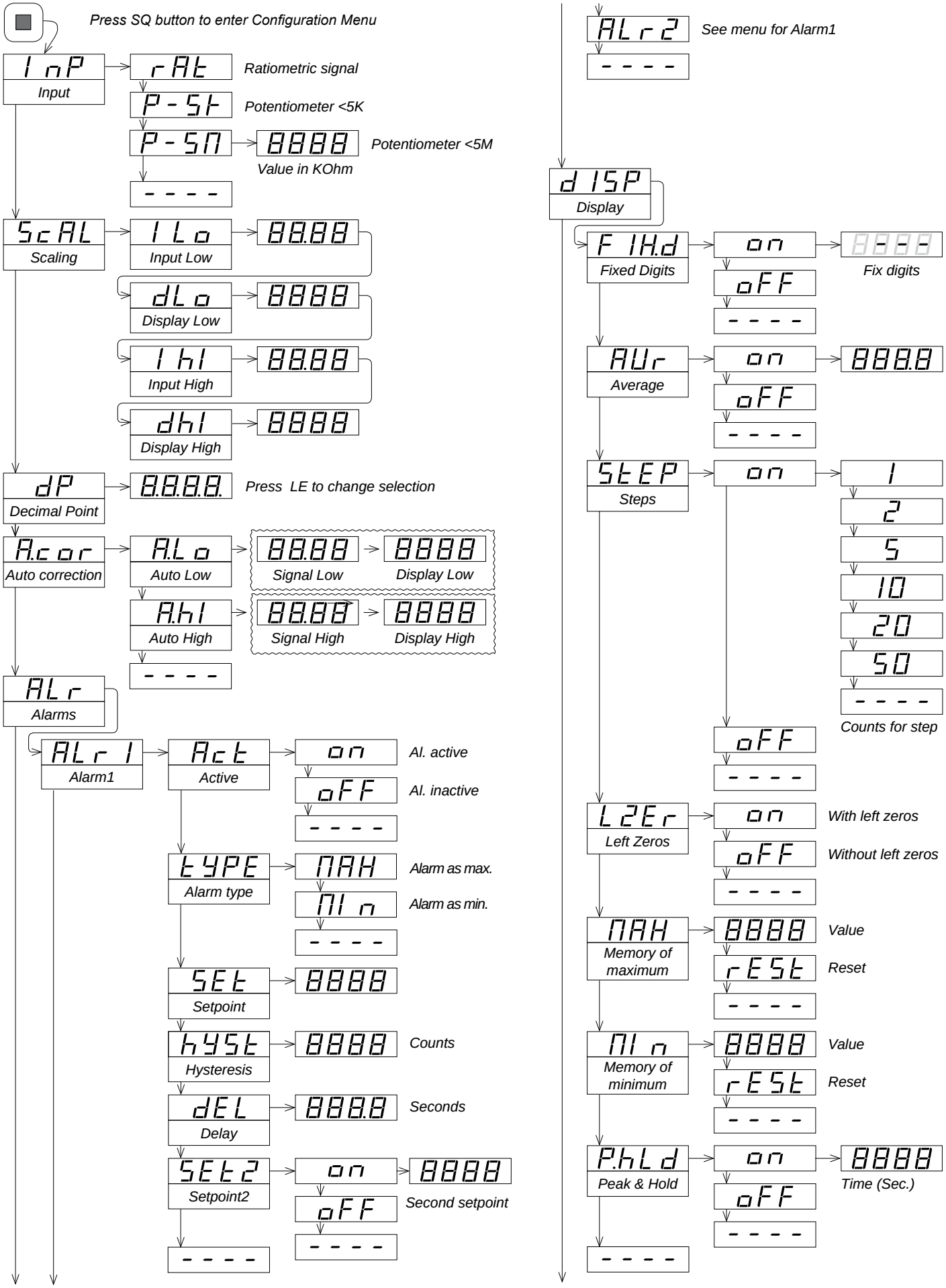
Button UP - Moves vertically on the menu entries. When entering a numeric value (for example a setpoint value) modifies the current digit by increasing its value up from 0 to 1, 2, 3, 4, 5, 6, 7, 8, 9.

Button LE - Leaves the current menu. Pressing LE several times will leave all menus. When leaving all menus in the configuration menu, changes will be saved . When entering a numeric value (for example a setpoint value) it moves from one digit to the next. Each digit value can then be modified with the UP button.

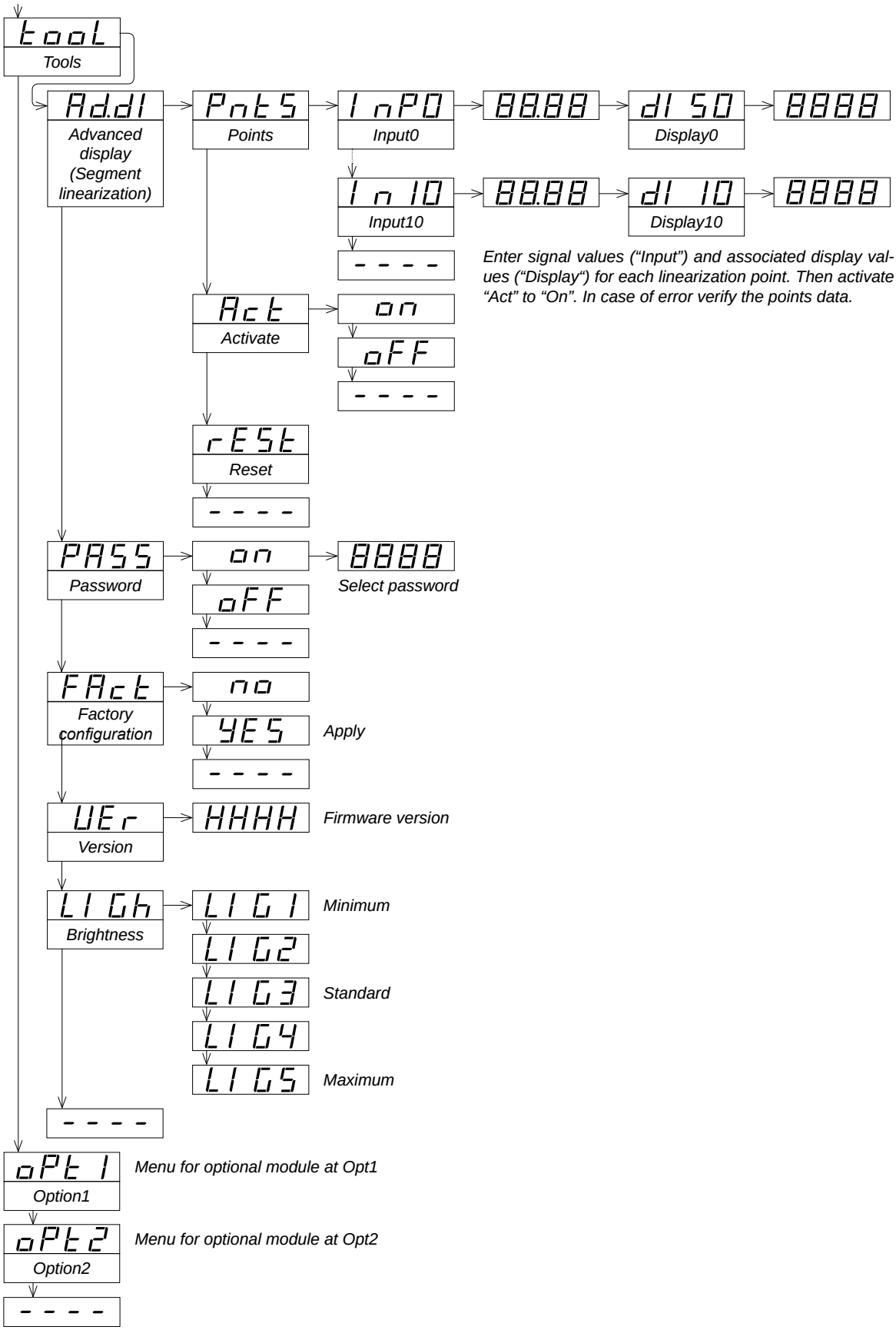
1.9 Default factory configuration

Range and scaling	Pot.<5K
Scaling	0/99.99%=0/99.99%
Alarms 1,2 and 3	
Active	Off (not managed)
Type	maximum
Setpoint	1000
Hysteresis	0 counts
Delay	0.0 seconds
Setpoint2	Off
Display	
Fixed digits	Off
Average	Off
Steps	Off
Left zeros	Off
Add zero to the right	Off
Memory of maximum	-1999
Memory of minimum	9999
Peak & Hold	Off
Tools	
Segments	Off
Password	Off
Brightness	3

1.10 Configuration menu



1.10 Configuration menu (cont.)



1.10.1 Input menu

The "input" menu selects the input signal range. Options are :

Ratiometric signal

Potentiometer <5K

Potentiometer <5M in this range the value of the potentiometer must be introduced (in KOhm)

1.10.2 Scaling

The display scaling is based on 4 parameters. These parameters define the two points of the straight line "signal / display".

Input Low ("ILo")	Signal input low
Display Low ("dLo")	Display low
Input High ("Ihl")	Signal input high
Display High ("dhl")	Display high

1.10.3 Decimal point

Select the position for the decimal point. Modify with the LE button and validate with the SQ button.

1.10.4 Auto correction

Assigns the current input signal value to the Input Low or Input High configuration parameters. The new values for Input and Display are displayed.

Auto Low (A.LO) - Select "A.LO" to set the current input signal value to the Input Low configuration parameter.

Auto High (A.HI) - Select "A.HI" to set the current input signal value to the Input High configuration parameter.

1.10.5 Alarms

The instrument can manage up to 2 alarms. These alarms control optional relays R1 (see section 2.1) which can be installed at slots Opt1 and Opt2. More alarms can be achieved by installing special control modules R2 and R4. Configuration menus for special modules are not listed in this document.

Active (ACT) - Value "ON/OFF". Defines if the instrument has to manage this alarm or not. Select "OFF" for alarm not managed.

Type (TYPE) - Value "MAX/MIN". Defines the behavior of the alarm as maximum or minimum alarm. The alarms configured as maximum are activated when the display value is equal or higher than the setpoint. The alarms configured as maximum are deactivated when the display is lower than the setpoint. The alarms configured as minimum have the inverse behavior.

Setpoint (SET) - Value from "9999" to "-1999". Alarm set point.

Hysteresis (HYST) - Value from "0" to "9999". Points of hysteresis. The hysteresis applies on the deactivation of the alarm.

Delay (DEL) - Value from "0.0" to "99.9" seconds. Delay to be applied to the relay activation and deactivation. Relays are activated and deactivated X seconds after the activation / deactivation of the alarm. The delay affects only to the relays. The delay does not affect to the front leds.

Setpoint2 (SET2) - Value from "-1999" to "9999". Second setpoint. The second setpoint allows for the creation of activation windows. If the alarm is configured as maximum with setpoint 1000 and setpoint2 is configured at 1500, the alarm will be activated between 1000 and 1500 and the alarm will be deactivated when display is <1000 and >1500. Setpoint2 is affected on the same way as the setpoint with hysteresis and delays.

1.10.6 Display

Functions on this menu allow for configuration of the display.

Fixed Digits (FIX.D) - Allows a digit to be fixed to a predefined value (for example, least significant digit fixed to "0"). It is a condition to fix a digit that all digits to its right are also fixed. Value "-" shows that the digit is not fixed.

Average (AVR) - Recursive filter applied to display. Value from "0.0" to "99.9". The severity of the filter increases with the value selected. Increasing the severity of the filter makes the display response slower.

Steps (STEP) - Display changes on predefined steps. Values are 1, 2, 5, 10, 20 and 50. The display is made in steps of X counts. For example, select a step of 20 will make the display to change in steps of 20 (1420, 1440, 1460, ...).

Left Zero (LZER) - Value "On/Off". Select "On" to visualize zeros to the left.

Maximum (MAX) - Memory of maximum display. Indicates the maximum value of display since the last reset of the memory. Memory is reset on the following cases : manual reset from the Configuration Menu (Maximum), change on the input signal (Input), modification on the scaling (Scaling), change on the decimal point (dP), modification of the linearization segments, or instrument power-down.

Minimum (MIN) - Memory of minimum display. Indicates the minimum value of display since the last reset of the memory. Memory is reset on the following cases : manual reset from the Configuration Menu (minimum), change on the input signal (Input), modification on the scaling (Scaling), change on the decimal point (dP), modification of the linearization segments, or instrument power-down.

Peak & Hold (P.HLD) - Peak & Hold function detects sharp drops in the displayed value, and holds the display if a display drop is detected. To disable the hold function for a moment, press any of the front buttons or wait for a predefined time :

Time 0	hold disabled (Off)
Time 1 a 3999	seconds, before disabling the hold
Time 4000	infinite hold

The counting of seconds is started each time there is an increase in the display value. Alarms will follow the input signal while hold is active.

1.10.7 Tools

Advanced Display (AD.DI) - Segments linearization. The instrument has 10 linearization segments (11 points). Each linearization points is formed of a signal input value ("INPX") and an associated display value ("DISPX"). Enter the values for each point from the Points menu ("PNTS"). It is required that the input signal values "INPX" must increase for each new point. When all points are entered, select "Act" value to "On" in the activation menu. A check is automatically performed when entering the points and when activating the points. In case of error verify the data entered on the points. Leave the menu pressing "LE" button. Reset option "REST" deletes all existing points.

Password (PASS) - Select a number to act as password. This password will be requested when entering the Configuration Menu. To deactivate the password select "Off".

Factory Settings (FACT) - Factory default configuration. Select "yES" to activate the factory default configuration.

Version (VER) - Firmware version installed.

Light (LIGH) - Brightness. Select between 5 predefined levels of brightness.

1.10.8 Menu OptX - Options

Menu options OPT1 and OPT2 give access to the configuration menus of the options installed at slots Opt1, Opt2 and Opt3. This menu depends on the installed option. If there is no option installed the instrument shows "*NONE*". Control modules R1 are controlled from the standard alarm menu (see section 1.12.7).

1.11 Messages and errors

When the instrument detects that the displayed value does not correspond to the expected value, the display will flash and alternate with a message.

"**h.udr**" Hardware underrange. The input signal is negative.

"**h.oVr**" Hardware overrange. The input signal is higher than excitation voltage (+5V).

"**d.udr**" Display underrange. The instrument is displaying the minimum value (-1999) and can not display below.

"**d.oVr**" Display overrange. The instrument is displaying the maximum value (9999) and can not display above.

"**hoLd**" The instrument is showing the value present when the hold function was activated. Hold function is active.

"**Min**" The instrument displays the minimum displayed value in memory. The minimum visualization is active.

"**MAX**" The instrument displays the maximum displayed value in memory. The maximum visualization is active.

"**P.hLd**" The instrument displays the peak value. Function Peak&Hold is active.

"**Err.0**" Values introduced on the "ScAL" menu are not valid. Default values are activated. The slope defined by the two points is almost vertical (higher than 5000):

"**Err.1**" Password incorrect.

"**Err.2**" The instrument has detected an installed option but was unable to communicate.

"**Err.3**" Related to the edition of a linearization point. Returns to the point for further edition. The value of "InPX" of the edited point is lower than "InPX" of the previous point.

"**Err.4**" Related to the activation ("Act") of the linearization segments ("Ad.dI"). Activation is not allowed. The value "InPX" of one of the points is higher than "InPX" of the next point.

"**Err.5**" Related to the activation ("Act") of the linearization segments ("Ad.dI"). Activation is not allowed. The slope defined by one of the segments is almost vertical.

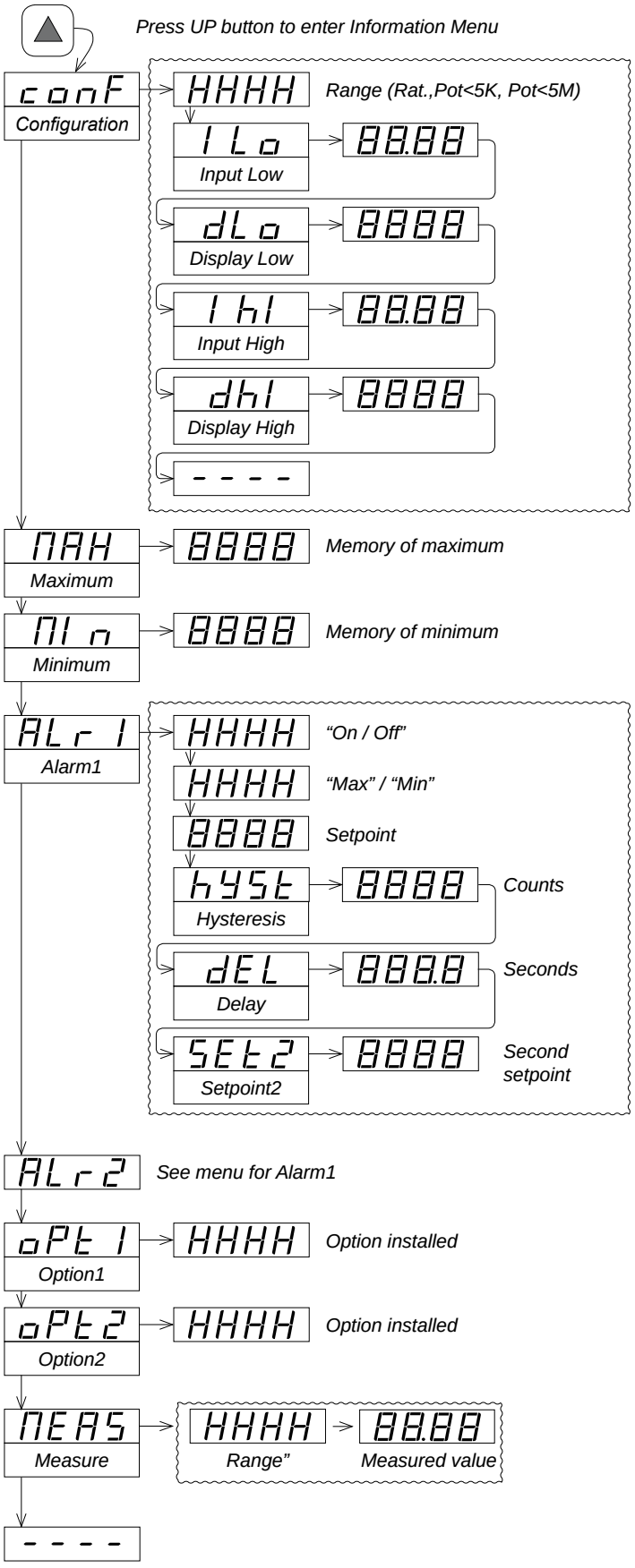
Slope condition for Err.0 and Err5

$$\frac{(dhI\text{-}dLo)\ [Counts]}{(IhI\text{-}ILo)\ [mA\ or\ Vdc]} < 5000$$

"**Err.8**" Excitation voltage overloaded. Excessive current is being demanded to the excitation voltage. Potentiometer nominal value is lower than 150 Ohms.

"**E.101**" Option is installed but the type can not be recognized.

1.12 Information menu



1.12.1 Information menu

Configuration (Conf) - Informs the configured input signal range (4/20mA, 0/10Vdc, ...), and the values for input low "ILo", display low "dLo", input high "IhI" and display high "dhI".

Maximum (MAX) - Value of the maximum display.

Minimum (MIn) - Value of the minimum display

AlarmX (ALX) - Configuration of alarm X. The sequence of information shows if the alarm is being managed ("On/Off"), the alarm type ("Max/Min"), the setpoint, the hysteresis value, the activation delay and the value of setpoint2 ("Off" or the setpoint2 value).

OptionX (OptX) - Type of module installed. If there is no module shows "nonE".

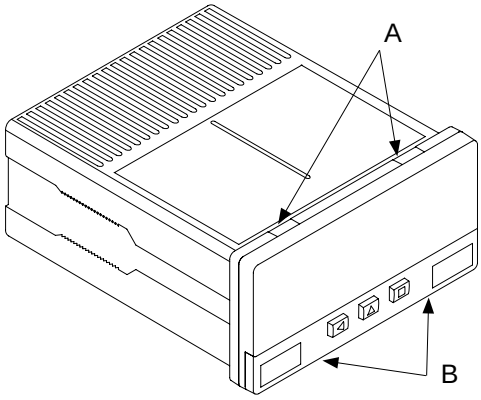
Measure (MEAS)- Multimeter function. Shows the value of the input signal without scaling. This is the real value the instrument is receiving on terminals, in Vdc or mA.

1.13 Accessing the instrument

You may need to access the inside of the instrument to insert additional modules. Use a flat screwdriver to unlock the upper clips marked with "A". Then unlock the lower clips marked with "B" and move out the front filter. Let the inside of the instrument slide out of the housing.

To reinsert the instrument make sure that all modules are correctly connected to the pins on the display module. Place all the set into the housing, assuring that the modules correctly fit into the internal guiding slides of the housing. Once introduced, place again the front filter by clipping first the upper clips "A" and then the lower clips "B".

Important - If your instrument was delivered with the IP65 front seal option, accessing the inside of the instrument will permanently break the IP65 seal on the areas of clips "A" and "B".



1.14 Warranty

All instruments are warranted against all manufacturing defects for a period of 24 MONTHS from the shipment date. This warranty does not apply in case of misuse, accident or manipulation by non-authorized personnel. In case of malfunction get in contact with your local provider to arrange for repair. Within the warranty period and after examination by the manufacturer, the unit will be repaired or substituted when found to be defective. The scope of this warranty is limited to the repair cost of the instrument, not being the manufacturer eligible for responsibility on additional damages or costs. .

1.15 Installation precautions

Risk of electrical shock. Instrument terminals can be connected to dangerous voltage.

Instrument protected with double isolation. No earth connection required.

Instrument is in conformity with CE rules and regulations. See "CE Declaration of Conformity" further in this document.

This instrument has been designed and verified according to the 61010-1 CE security regulation, and is designed for applications on industrial environments. See the "CE Declaration of Conformity" further in this document for information on the category of measure and the degree of pollution levels that apply.

Installation of this instrument must be performed by qualified personnel only. This manual contains the appropriate information for the installation. Using the instrument in ways not specified by the manufacturer may lead to a reduction on the specified protection level. Disconnect the instrument from power before starting any maintenance and / or installation action.

The instrument does not have a general switch and will start operation as soon as power is connected. The instrument does not have protection fuse, the fuse must be added during installation.

The instrument is designed to be panel mounted. An appropriate ventilation of the instrument must be assured. Do not expose the instrument to excess of humidity. Maintain clean by using a humid rag and do NOT use abrasive products such as alcohols, solvents, etc.

General recommendations for electrical installations apply, and for proper functionality we recommend : if possible, install the instrument far from electrical noise or magnetic field generators such as power relays, electrical motors, speed variators, ... If possible, do not install along the same conduits power cables (power, motor controllers, electrovalves, ...) together with signal and/or control cables.

Before proceeding to the power connection, verify that the voltage level available matches the power levels indicated in the label on the instrument.

In case of fire, disconnect the instrument from the power line, fire alarm according to local rules, disconnect the air conditioning, attack fire with carbonic snow, never with water.

1.16 CE declaration of conformity

Manufacturer FEMA ELECTRÓNICA, S.A.
Altimira 14 - Pol. Ind. Santiga
E08210 - Barberà del Vallès
BARCELONA - SPAIN
www.fema.es - info@fema.es

Products - S40-R

The manufacturer declares that the instruments indicated comply with the directives and rules indicated below.

Directive of electromagnetic compatibility 2004/108/CEE
Directive of low voltage 73/23/CEE

Security rules 61010-1

Equipment	"Fixed"
	"Permanently connected"
Pollution degree 1 and 2 (without condensation)	
Isolation	Double
Category	CAT-II

Emission rules

61000-6-4	Generic rule of emission

Immunity rules

61000-6-2	Generic rules of immunity
61000-4-2	By contact ±4KV - Criteria B
	On air ±8KV - Criteria B
61000-4-3	Criteria A
61000-4-4	On AC power lines: ±2KV - Criteria B
	On DC power lines: ±2KV - Criteria B
	On signal lines : ±1KV - Criteria B
61000-4-5	Between AC power lines ±1KV - Criteria B
	Between DC power lines ±0.5KV - Criteria B
61000-4-6	Criteria A
61000-4-8	30A/m at 50Hz - Criteria A
61000-4-11	0% 1 cycle Criteria A
	40% 10 cycle Criteria A
	70% 25 cycle Criteria B
	0% 250 cycle Criteria B

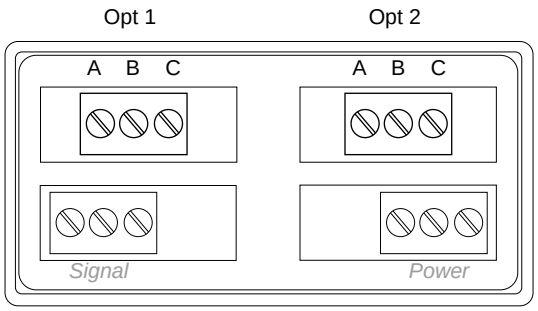
Barberà del Vallès October 2009
Daniel Juncà - Quality Manager

2. Output and control modules

2.1 Module R1

Module with 1 relay. Up to a maximum of two R1 modules can be installed in one S Series panel meter. For more relay output needs, check special modules R2 and R4. For more information see document *2657_S40_OPTIONAL_MODULES* at *www.fema.es*

Relay type	3 contacts (Common, NC, NO)
Maximum current	8A (resistive load)
Voltage	250 Vac continuously
Installable at	Option1 and/or Option2

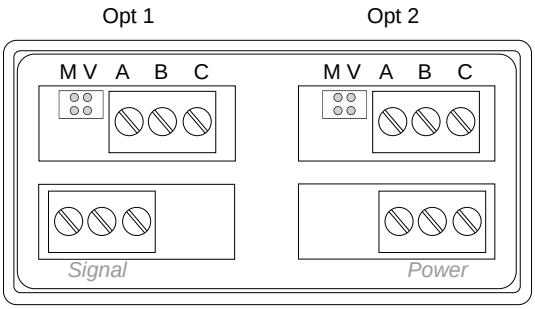


Terminal A	Common
Terminal B	NO - Normally Open
Terminal C	NC - Normally Closed

2.2 Module AO

Module with 1 analogue output. Configurable 4/20mA or 0/10Vdc. Output signal proportional to the reading. Scaling through the frontal keypad. Up to a maximum of two AO modules can be installed in one S Series panel meter. For more information see document *2657_S40_OPTIONAL_MODULES* at *www.fema.es*

Output	4/20mA, 0/10Vdc selectable
Accuracy	0.1% FS
Isolated	yes, 1000Vdc
Thermal drift	50 ppm/ºC for Vdc 60 ppm/ºC for mA
Installable at	Option1 and/or Option2



Jumper M	mode mA
Jumper V	mode Vdc
Terminal A	Vexc (+13.8Vdc @25mA)
Terminal B	Signal output (mA or Vdc)
Terminal C	GND

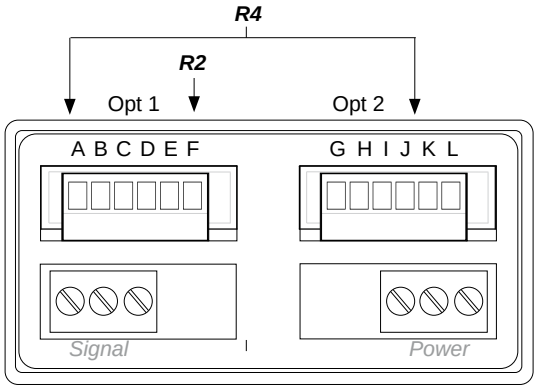
2.3 Modules R2, R4

Special modules with 2 and 4 relays. Use special modules R2 or R4 when standard R1 modules do not provide required functionality for your application. Only one special module R2 or R4 can be installed in an S Series panel meter. Special modules R2 and R4 are not compatible with R1 modules.

Configuration is done through the OPTx entry of the configuration menu. Functionality for R2 and R4 modules differs from standard R1 modules. For more information see document *2657_S40_OPTIONAL_MODULES* at *www.fema.es*

Number of relays	2, or 4
Relay type	3 contacts (Common, NO, NC)
Maximum current	6A (resistive load) (each relay)
Voltage*	250 Vac continuously
Installable at slot	Opt.1. R2 fills OPT1 R4 fills OPT1 and OPT2
Terminal	Plug-in screw terminals pitch 3.81mm

** Terminals approved for 300V (according to UL1059, groups B and D) and 160V (according to VDE in CAT-III and pollution degree 3).*



Terminal A	Relay1 Common
Terminal B	Relay1 NO - Normally Open
Terminal C	Relay1 NC - Normally Closed
Terminal D	Relay2 Common
Terminal E	Relay2 NO - Normally Open
Terminal F	Relay2 NC - Normally Closed
Terminal G	Relay3 Común
Terminal H	Relay3 NO - Normally Open
Terminal I	Relay3 NC - Normally Closed
Terminal J	Relay4 Common
Terminal K	Relay4 NO - Normally Open
Terminal L	Relay4 NC - Normally Closed

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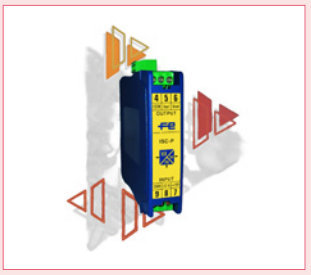
other products

Panel Meters
Standard 96x48mm

Panel Meters
Small 72x36mm

Panel Meters
Miniature 48x24mm

Large Displays
60&100mm digit



Signal Converters
& Isolators

Bar Meters

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